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ABSTRACT

The author first reviews traditional approaches to classroom spelling instruction, then presents research on remedial spelling instruction for learning disabled children. Section I considers factors which make spelling harder than reading, the history of traditional spelling instruction from Colonial times to the 1950s, the generalization controversy which concerns the utility of organizing instruction to take advantage of the English spelling system, the contribution of modern linguistics to the structure of English orthography, and research on other issues in spelling instruction (including the incidential-systematic controversy, context vs. list presentation of words, test-study-test vs. study-test procedures, distributed vs. mass learning, number of words in a lesson, methods of word study, and focus on the difficult parts of words). Part II begins with a look at what children are learning when they learn to spell. Types of spelling disability are pointed out and research is reviewed on the following approaches: Orton-Gillingham method which involves simultaneous oral spelling, the G. Fernald method known as the V-A-K-T (visual-auditory-kinesthetic-tactile) system, A. Bannatyne's system which always begins with nonvisual training, programs following the Orton tradition, and programs based on task analysis and criterion referenced tests. Among conclusions are that children are learning a great deal about the structure of language when they learn to spell, that spelling disabilities vary largely on the dimension of severity with the most severe cases unable to manage even simple phonetic spelling, and that major spelling methods have points of commonality (including teaching of reading and spelling as coordinated subjects, careful sequencing of words, an essentially multisensory approach, and an emphasis on mastery of each step before progressing to the next). (SB)

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TEACHING SPELLING TO LEARNING DISABLED CHILDREN: TRADITIONAL AND REMEDIAL APPROACHES TO SPELLING INSTRUCTION

Margaret Stanback

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Principal Investigators

N. Dale Bryant, Ph.D.
Jeannette Fleischner, Ed.D.
Walter MacGinitie, Ph.D.
Margaret Jo Shepherd, Ed.D.
Joanna Williams, Ph.D.

Frances P. Connor, Ed.D.
Institute Director

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TEACHING SPELLING TO LEARNING DISABLED CHILDREN: TRADITIONAL AND REMEDIAL APPROACHES TO SPELLING INSTRUCTION*

This report is divided into two parts: traditional approaches to classroom spelling instruction and remedial spelling instruction. The two parts are not proportional. The research on classroom instruction is voluminous with quality perhaps inversely related to quantity, while research on remedial instruction is virtually non-existent.

Some of the shortcomings of research on spelling instruction have been pointed out by Personke (1973). He notes that while there have been comparisons of methods by the hundreds, research designs are generally careless at best, and there has been a failure to isolate and control critical variables.

In the area of remedial instruction, since there is practically no research to consider, we must turn for our insights to the remedial approaches which have been developed by teachers, psychologists, and psycho-neurologists who have worked with children having reading and spelling problems. The best practitioners have learned something from the children they have worked with and perhaps should be listened to.

Extent of the Spelling Problem

The spelling problem is not confined to learning disabled children. Current educational journals express concern about the low state of spelling ability in general and confusion about how best to cope with the problem in

*This paper was prepared as a literature review of spelling instruction for the Institute's Spelling Task Force in 1978. It has not been brought up to date since that time.

view of the conflicting recommendations passed down by researchers. In an NEA publication, Interpreting Language Arts Research for the Teacher, Robards (1971) speaks of the "chaos of spelling", noting that one can find research to support his approach to teaching spelling, whatever the method may be.

T. Horn (1969) in a review of spelling for the Encyclopedia for Educational Research reports the decline of spelling scores in this century, with the student of 1915 spelling better than the student of today. Despite differences in sampling population and methods usually cited as disclaimers of academic decline, it seems reasonable that spelling should be poorer today in view of its generally lower prestige as a school subject.

If spelling is cause for concern with many average children, with the learning disabled it is very often a disaster. In fact, difficulty with spelling may be the single most common academic failing of learning disabled children. Dr. Orton in 1937 stated that "Reading disability cases are without exception poor spellers" (Orton, 1937). More recently, Black (1973), in a study of 50 subjects selected because of a reading problem, found that all 50 also had a spelling problem. Even in children who read adequately, a spelling disability may be present (Nelson & Warrington, 1974; Naidoo, 1972).

Not only does a spelling problem almost invariably accompany a reading problem, it is almost always the more severe of the two deficiencies. Dyslexic children's spelling achievement scores are reported to be consistently below reading scores (Rabinovich, 1968). Further, with remedial help, dyslexics may catch up in reading, but a residual spelling problem remains and is notoriously resistant to remedial training, so that ex-dyslexics typically spell poorly throughout life (Critchley, 1970).

This discrepancy between reading and spelling scores - no matter how poor the reading, the spelling is almost always worse - has been identified by Boder (1970, 1971, 1973) as an important criterion in the diagnosis of dyslexia. She has used the atypical reading and spelling pattern to distinguish the child of normal intelligence with a specific reading disability from the low ability child who reads about as poorly as he spells.

Even in a normal school population, spelling presents a special problem for some children. Poor readers who are good spellers are very rare, but there are some good readers who are surprisingly poor spellers. In a normal school population, Frith found that 10 of 200 12-year-olds of average intelligence and reading ability were seriously retarded in spelling (Frith, Reading by Eye and Writing by Ear, unpublished working paper, 1977).

There is one reported exception to this pattern of spelling being worse than reading. It sometimes occurs that very young children, in the earliest stages of reading and spelling acquisition, seem to spell very naturally by using the phonological segments of the word, yet there is a period when they cannot readily read the same words they have written (Read, 1973, 1975a, 1975b; Chomsky, 1971, 1975; Rhea, 1976). Aside from this temporary phenomenon, however, spelling seems to be definitely the harder skill.

Why Spelling is Harder than Reading

The usual explanation for the greater difficulty of spelling than reading is in terms of the different demands on visual memory of the two

skills. A word may be recognized in reading without full information about spelling, while for spelling, precise and detailed information is necessary to accurately reproduce the word. This has been described as the difference between recognition memory and total recall (Gibson & Levin, 1975). The usual analogy is that we often recognize people without having very accurate information about their facial features.

Smith (1971, 1972), in discussing the differential difficulty of reading and spelling, speaks of the advantage the reader has in terms of the redundancy of written language. The reader does not need to identify every letter or even every word, while the speller must set down every letter of every word in the correct order.

Another factor suggested to explain the disproportionate difficulty of spelling and reading concerns properties of the stimulus. While the written symbols for reading are relatively concrete and permanent, the stimuli for spelling are speech sounds - either overtly spoken or the inner voice - and are much less tangible or durable (Cronnell, 1971).

Still another way to explain the differential difficulty of spelling and reading is that reading is a receptive language process--we are receiving the language and thoughts of another via print, while spelling is a productive language process--and the developmental language people tell us that production is harder than reception.

A rather convincing explanation for the inordinate difficulty of spelling as compared to reading is in terms of the asymmetry of phoneme-grapheme correspondences for the two skills (Cronnell, 1971). Venezky's (1970a) analysis revealed that while there are only 26 letters to represent 40 or so phonemes, there are actually 59 spelling units when letter

combinations such as sh, ch, tch, ea, etc. which represent one phoneme are considered. An analysis by Berdiansky, Cronnell and Koehler (1969) identified 69 spelling units. Therefore, the reader works from a set of many stimuli to fewer responses, while the speller goes from a smaller set of stimuli to a larger set of possible responses. For example, the letter f is always pronounced /f/, while the phoneme /f/ may be spelled f, ff, ph, or gh. The digraph oa is always pronounced /o/, while the phoneme /o/ may be spelled o, ow, oe, o-e, oa, etc.

There is, in fact, only one correspondence which is simpler for spelling than reading. In reading, the letters th may be /θ/ or /ð/ while for spelling, both /θ/ and /ð/ are spelled th.

There is another factor. Where there are options in decoding, e.g., ow can be pronounced /o/ or /aʊ/, the correct choice will be a real word, e.g., p-l-o-w, plow, whereas in spelling there is no way to know whether the right option has been selected unless the correct spelling is already known.

Thus, there are many reasons why spelling is more difficult than reading, and it is not surprising that it is an almost intractable problem for the child with a true disability. Yet the spelling problem does not get the attention of the reading problem, and spelling as a school subject receives far less attention in the classroom than it did historically. Spelling, in Colonial times, was truly the focus of literacy training, and the belief was that through spelling children would learn to read, almost incidentally. Today it is reading that is the respected school subject, with instruction in spelling often less than systematic.

This suggests it might be useful to look backward at the history of spelling instruction, for we may have something to learn from the way spelling was taught in the past. In particular, it seems possible that the

teaching of spelling has evolved away from a method which might have been helpful to LD children.

Traditional Spelling Instruction

A Historical Sketch - Colonial Times to the 1950's*

At the beginning of formal education in the United States, "spelling and reading went hand in hand" (Hodges, 1977). They were taught from the same book by an alphabetic method. In Colonial times, children first learned the alphabet, then letter combinations for 180 syllables beginning with ab, eb, ib. They learned most of the possible 2-letter vowel-consonant as well as consonant-vowel syllables (ba, be, bi) by spelling them aloud, pronouncing them, and writing them on their slates. (Note that this is what we would call today a multisensory approach.) Only after the 2-letter syllables were mastered did the student go on to 3-letter syllables and words. (Today we would call this mastery learning.) Once the child knew the basic syllables, there was much activity with word-building as the syllables were used to spell and read words of increasing numbers of syllables ("a-b, ab, r-a-b, rab. i-t, it. b-i-t, bit. r-a-b, rab. b-i-t, bit. --rabbit.") The controlling principle in all the spellers of the time was that of proceeding from simple to complex with respect to the number of letters and syllables in the word (Smith, 1934).

During the Colonial period, a standard reading and spelling primer used throughout the colonies was the New England Primer (Ford, 1962).

*This section draws heavily on two sources dealing with the history of spelling instruction as related to reading instruction: Matthews (1966) and especially Smith (1934), as well as historical surveys focused on spelling instruction: Hodges (1977); Hanna, Hodges and Hanna (1971); and Hanna and Hanna (1959).

It was first printed in England in 1683 and went through numerous American editions. It included the alphabet, the syllables, alphabet verses to illustrate each of the letters, as well as Bible verses and other religious selections.

We get some idea of how the children were taught to read through spelling from an old book on method published in 1660. Written by Charles Hoole, it was called "New Discovery of the Old Art of Teaching School." As you read the selection, bear in mind that there were no books in the homes of that period, or at best, one book - the Bible. There were no signs around town, no Sesame Street. So, while most children of today start school able to discriminate the letters of the alphabet, this wasn't true at that time. Here is what the author tells us about teaching the beginner:

> The greatest trouble at the first entrance of children is to teach them how to know their letters one from another when they see them in a book altogether.
>
> Some have begun but with one single letter and after they have shewed it to the child have made him to find the same anywhere else in the book til he know that perfectly; and then they have proceeded to another in like manner, and so gone through the rest. (A nice little exercise in tracking-also a good demonstration of the principle of mastery learning.)
>
> Some have made pictures in a little book or upon a scroll...and by each picture have made that letter with which its name beginneth...The common way to teach a child to spell is, after he knows the letters of the alphabet, to initiate him into those few syllables which consist of one vowel before a consonant...and thence to proceed with him little by little... hearing him twice or thrice over until he can say his lesson and then putting him to a new one.
>
> After they have got some knowledge of their letters and a smattering of some syllables and words...to turn them into the ABC or Primer and therein to make them name the letters and spell the words till by often use they can pronounce (at least) the shortest words at first sight. (cited by Smith, 1934)

Having graduated from the Primer, the child was put to reading the Bible aloud and encouraged to learn verses by heart.

After the Revolution, the most important reading and spelling book of all time was published in 1783 under the title "Grammatical Institute of the English Language." It was retitled "The American Spelling Book" in a 1787 revision, and it came to be known by generations as Webster's Blue Backed Speller, selling tens of millions of copies--the largest sales of any book except the Bible.

It began with an analysis of the sounds of the language and their spelling. Consonants and vowels were explained - even hard and soft c are there. Then follow the syllables, then lists of one-syllable words arranged according to "family", then words of more than one syllable divided into syllables and arranged by accent pattern and number of syllables - first 2-syllable words, then 3-syllable, etc., up to 6-syllable words. In addition, there were tables of words organized according to similarity of sound and common spelling pattern.

The idea of the primacy of spelling - of the importance of spelling in learning to read - continued for quite a long time and was paralleled by an emphasis on accurate oral reading.

In the early 1840's, there were rumblings of change and the beginning of the end of the coordinated teaching of reading and spelling. American educators had visited Prussia and were impressed by the whole-word method of teaching reading. Horace Mann, who was especially influential in promoting the whole-word approach to reading, also had an influence on spelling instruction. He reacted against the dull monotony of the spelling routine and felt that spelling should be taught separately from reading with attention given to making it interesting and stimulating the learner's curiosity.

In this decade new books appeared which presented whole words first.

Concurrent with praise for the new reading method as saving children years of drudgery, concern was expressed because the children couldn't spell the words. Then a few years later there was growing dissatisfaction that, although children taught by the word method learned to read faster initially in the first 3 grades, they did not read or spell well in the upper grades.

This radical new whole-word method didn't catch on overnight, however. Educators tend to be conservative, and the alphabetic method continued to be used by most teachers at least throughout most of the 19th century, with the teaching of reading and spelling still closely tied. Spelling words by letter sounds, not names, was a popular innovation in the latter half of the 19th century. But beginning around 1880 and until the First World War, the practice of learning the alphabet and spelling words as an initial step came generally to be abandoned, and reading and spelling more and more went separate ways. Silent reading was increasingly emphasized, and training in phonics was generally delayed and given a more subordinate role.

While Webster had approached spelling from a decoding standpoint, as time passed the practice became one of giving children lists of spelling words to memorize - as many as 50 words a week - by whatever means they could. By the 1920's, spelling had become divorced from reading, or, at best, "a poor relation of reading" (Hanna, Hodges, and Hanna, 1971).

Size of the spelling vocabulary became an issue as some lists climbed into the thousands. From about the turn of the century questions had been asked about the utility of the words assigned children to learn. Hanna and Hanna (1959) made a random selection from Henderson's Test Words

in English Orthography, 1885, and found listed words like phthisic, posthumous, tautology, and egregious. Which words would be included in a spelling program became a major question for research, and this resulted in word frequency lists such as the Ayers list (1913), the Thorndike Teachers Word Book (1921), and the Horn list (1926), which were based on analyses of the frequency of words in adult writing. Later, Rinsland (1945) examined the words in children's writing grade by grade and compiled a 3,000 word list which included words most frequently used by children. Spelling books of the thirties reflected this concern with word frequency. Words were chosen and sequenced on the basis of frequency of use and presented in the context of attractive stories.

There are difficulties with sequencing words according to frequency. When words of highest frequency are taught first, this means the child is going to get a large number of irregularly spelled words very early rather than being exposed to a word sample which would make it possible to see spelling patterns and form generalizations about sound-symbol correspondences. This is because the modern pronunciation of high frequency words - the most used everyday words - has departed most from the standard spelling. When words are sequenced according to frequency, the beginning speller is going to get words like once, many, and could.

Learning to spell an irregular word like once is teaching the child nothing but the spelling of that one word - nothing that he can use in reading and spelling other words; while knowing a-b, ab could help him with the whole "ab family" and perhaps with words like absent and tablet.

Throughout the thirties, forties, and fifties, pattern was laid aside and the frequency principle was in the ascendency, with words taught primarily as independent, unrelated entities. A method of word study had

been set down by Ernest Horn in 1919 for such learning. The burden was on rote memory, and there were 9 steps, which included drill in recalling the visual image of the word and practice writing it from memory. These study steps appear virtually unchanged today and carry the endorsement of traditional educators. In a 1977 NEA publication, Spelling: The Application of Research Findings (Allred, 1977), these same study steps are recommended as the best method for learning to spell.

Sequencing words for spelling instruction according to the frequency principle continues today. In the current New York State list, Our Daily Words - A Basic Spelling Vocabulary for Elementary Schools, words are still sequenced according to frequency. At grade 3 - the earliest grade at which, according to the manual, spelling is to be formally taught - children learn the words beautiful, Christmas, and already. At grade 6, they are presented with dip, gay, chop, and mix.

Such approaches, however, are becoming less and less typical. In the fifties there began a shift, with educators turning to linguists - to Leonard Bloomfield in particular - for enlightenment about how spelling should be taught, because children weren't spelling better despite efforts to make the lessons attractive and to focus attention on high frequency words used by them in their own writing.

What educators learned was that they might be overlooking the fact that English is an alphabetic language in which phonemes are represented by graphemes, and that a spelling program ought to begin by teaching the most regular correspondences. This raised the question of whether the English spelling system is sufficiently regular to base instruction on the alphabetic principle with an emphasis on rules and regularities, or whether it is so irregular that nothing is to be gained by focusing on the regularities.

This question of the degree of regularity of English sound-symbol correspondence and its implication for spelling instruction had been a much-debated issue from the 1900's. Later termed "the generalization controversy" (Yee, 1966), it has continued to be a major issue in spelling instruction and has generated considerable research.

The Generalization Controversy

The generalization controversy concerns the utility of organizing spelling instruction to take advantage of the regularity of the English spelling system. Those advocating this approach maintain that the orthography is sufficiently regular for generalizations to assist in the spelling of related words. Those on the other side argue that the overwhelming irregularity of English orthography requires that the spelling of each word be mastered individually.

The Case Against Teaching Generalization

The foremost authority in the field of spelling instruction to have advocated the non-utility of generalization is Ernest Horn. His position modified somewhat over time, as the following quotations from his work show.

> In teaching spelling, the chief dependence must be placed on learning each word as an individual problem. The more one studies the problems created by the unphonetic character of English spelling, the more he must marvel at the ease and rapidity with which many students learn to spell. (1929)

> There are several types of evidence that should be considered: (a) More than a third of the words in A Pronouncing Dictionary of American English have more than one accepted pronunciation... If the spelling of a word is phonetically regular in one pronunciation of a word, it is not likely to be in another. (b) Most sounds are spelled in many ways, and there are numerous exceptions to the commonest spellings--hundreds for many

> sounds. (c) More than half of the words in a dictionary contain silent letters. A student cannot be expected by reasoning to insert a letter which does not signify nor help to signify any sound...(d) Most letters, and especially the vowels, spell many sounds and all but four--j, q, v, and x--are silent in some words. (e) It is a principle of behavior that when more than one reasonable choice is available, responses are uncertain. This is shown clearly in children's misspellings. (f) Unstressed syllables are difficult to spell; they are less distinctly pronounced and the vowel sounds are either weakened or replaced with the schwa or the short i sound. (g) Generalizations, whether phonetic or orthographical, are misapplied as well as applied correctly. (h) There are some fairly consistent characteristics of English spelling. Most of these pertain to word patterns, word positions, the adding of prefixes and suffixes, the influence of adjacent sounds and letters. For example, the sound of k at the beginning of a word or syllable is, with few exceptions, spelled with c before a, o, u, r, and l, but with k before e, i, and y. (1960)

> The teaching of phonic generalizations, whether based on the most common spelling or on word patterns, should be limited to generalizations which apply to a large number of words and have few exceptions...(1960)

There are a number of studies done over the past sixty-five years that lend some support to this position, especially as to the utility of teaching spelling rules. In 1912, Cook found that out of seven spelling rules learned by college and high school students, only one rule could be recalled and applied. Turner (1912) in the same year, reported superior results for a group of pupils taught by direct drill as compared to those taught spelling rules.

A group of studies done during the 1930's also indicated limited utility of rules. Archer (1930) in a study of transfer of training in spelling, demonstrated that transfer operates in both a "positive" and "negative" fashion depending on whether the generalization is correctly or incorrectly applied. He concluded that for a rule to be justified it must be unambiguous in application, with exceptions carefully noted.

Sartorius in 1931 isolated a small number of rules which have few

exceptions and are relatively easy to understand. Even these rules, she warned, should be treated with caution until their value in the elementary school is established experimentally. In a follow-up study done in 1932, King concluded that it would be very difficult for children to learn to apply these rules.

Yee (1969), in a more recent empirical study, investigated the effects on spelling achievement of teaching selected generalizations--both sound-symbol correspondences and the rules for adding suffixes. He used Solomon's four-group design to measure the interaction of the corrected pretest procedure and generalization treatment on the spelling performance of 2,839 children in grades two through six. Findings were that instruction in generalization did not produce a significant difference in spelling achievement. In spelling untaught words requiring application of the generalization, the control group, which had the pretest but no instruction, performed better than the generalization treatment group.

Personke (1973) points out, however, some of the weaknesses of this study, as follows: (1) The time span of the study (two weeks) was too short to teach generalization, especially the "set" to use generalization, (2) The method used to teach the generalizations, taken from a single speller, was poor, (3) Lessons were carried out by inexperienced student teachers, and (4) Some of the generalizations taught were poor.

The Case for Teaching Generalization

Among studies supporting the teaching of generalization in spelling is a study by Wagner in 1912 which was described by Gates (1935) as "... the first comprehensive study of the value of grouping words according to

similar structure, especially phonetic elements." It compared sixth graders' spelling performance when words were grouped randomly or according to a common structure. Wagner's results showed the superiority of the grouping method. Tidyman and Johnson (1924) performed a similar experiment with fifth grade students. The grouping method produced, in two trials, ten and thirteen percent more words learned than the non-grouping method.

Watson (1935) carried out a series of studies on the value of spelling rules. Her findings indicated the superiority of (1) individual-practice with access to formulated rules over individual-drill without reference to rules, and (2) class-study of rules over class-drill without rules.

Research by Carroll (1930) demonstrated "phonetic generalization" in the spelling of fourth and fifth graders. Words a year above grade level were dictated to the students, and errors were analyzed. It was found that bright children made more errors that reflected "phonetic generalization" than dull children. Although such a finding sheds little light on the generalization controversy, it does raise questions about the plight of the dull child, if, in fact, ability to generalize is important in learning spelling.

Gates (1935) carried out a comprehensive, long-term (two year) study on generalization and transfer in spelling. Building on the work done at Teachers College by his students, Watson, Sartorius, King, Carroll and Mendenhall, Gates compared in grades two through eight two methods of teaching spelling--one designed to foster generalizations and the other treating words as isolated items. In the classes taught to generalize, words were grouped by pattern, e.g., well, tell, sell, or to illustrate a spelling rule, with students' attention called to the generalization, and

rules verbalized, e.g., "change y to i and add es". In the specific-learning classes, teachers were instructed not to call attention to the relationship between words, e.g., cat and cats were to be treated as unrelated words.

Gates found that while there was no significant difference between the two methods for studied words, the generalization method significantly improved children's ability to spell unstudied words. He concluded:

> In general, then, it may be said that a broad and varied program of generalization, while it does not increase ability to spell words studied during the term more than the Specific Learning Method, does tend to increase to some extent the power to spell new words and especially to handle the specific derivatives and other elements to which the generalization program was especially directed.

More recently, Personke (1966, 1967) carried out a two-phase study which compared the spelling achievement of children in West Lothian County, Scotland with American children in Jackson, Michigan. The mean IQ of the American sample was significantly higher than that of the Scottish sample. Despite this IQ differential, Scottish children, who are consistently taught to use phonetic generalization from the beginning of their school learning, were found to be superior to the American children in spelling achievement at all ages tested (age 7, 11, and 14) as measured on the Metropolitan Achievement Test. The greatest difference was twenty-six months at age eleven.

In the second phase of the study, the sample was stratified into fast, average, and slow groups. At all levels, differences favored the Scottish children and increased from the top to the bottom of the range. Personke infers that the spelling of the slowest students had apparently gained the most from direct instruction in generalization, while the

brighter American children had learned to generalize without help.

Another study suggesting the possible benefit of teaching generalization to slower students is reported by Pescosolido (undated). He compared the gain in spelling scores over a school year among second graders taught spelling by (1) a phonic-structural approach, (2) a whole-word approach, and (3) a teacher-directed approach which "relied on skill development of the reading program," e.g., when the digraph ea was taught for reading, the spelling list consisted of words such as each, beach, read, treat. The children all attended a college laboratory school, and IQ's ranged from 90 to 140. Results indicated, for the group as a whole, no significant differences among the three methods. When the group was stratified by IQ, however, it was found that within the 90 to 110 IQ range the group taught by a phonic-structural approach made significantly greater gains than those taught by the other methods.

Thus, studies on the value of a generalization approach in teaching spelling have produced mixed results, with the interesting suggestion that lower ability children benefit most from direct teaching in generalization. The issue continues to be researched and debated. A series of doctoral dissertations all reported no significant differences between groups using a linguistically based spelling program and those taught by a whole-word approach (Rice, 1968; Warren, 1969; Nollau, 1974).

The Contribution of Modern Linguistics

Modern linguistic analyses of the structure of English orthography - especially of the relationship which exists between words in speech and words in print - offer another kind of evidence for emphasizing generali-

zations in spelling instruction. Insofar as the regularities in the orthography as it relates to both the phonology and the morphology are better understood, teaching methods which take advantage of these regularities should make the learning of spelling more rational, and less capricious. A number of major studies point in this direction.

Hanna and Moore (1953) carried out a study which analyzed a 3,000 word vocabulary. It was the first attempt to quantify phoneme-grapheme relationships from the perspective of sound-to-spelling. Findings were as follows:

> Approximately four-fifths of the phonemes contained in the words comprising the spelling vocabulary of the elementary-school child are represented by a regular spelling.
>
> Nearly three fourths of the vowel phonemes are spelled by their regular letter representations from about 57 to about 99 percent of the times they occur...
>
> The single consonant phonemes have the highest spelling consistency. They are represented by their regular spellings about nine-tenths of the times they occur...
>
> About 82 percent of the consonant blends and speech consonants have only one spelling.

In a subsequent study, Hanna, Hodges, Hanna, and Rudorf (1966) used the computer to assist in the analysis of a corpus of 17,000 words. The study was done in two parts. Part I explored the contribution of a number of additional factors which contribute to the regularity of phoneme-grapheme correspondences. These factors included the number and frequency of different spellings of phonemes in relation to 1) their position in the syllable, 2) whether the vowel occurs in a stressed or unstressed syllable, and 3) the effects of the "internal surround" (e.g., after the phoneme /S/, /f/ is spelled ph as in sphere or sphinx.

Based on computer analysis of these factors, Hanna et al. concluded that more than half of the consonant phonemes have particular spellings which occur 80 percent or more of the time regardless of environmental factors. Many of the vowel phonemes also have particular spellings 80 percent or more of the time irrespective of environmental factors, although vowel phonemes collectively are less consistently spelled than are consonant phonemes. When factors of position in the syllable, syllable stress, and internal constraints were taken into consideration, the correct spelling of a phoneme could be predicted approximately 90 percent of the time.

It should be noted that these percentages refer to the spelling of phonemes--not to the spelling of entire words. In a four-phoneme word, for example, a reported figure of 80 percent phoneme-grapheme correspondence must be applied to each phoneme. An estimate of the "regularity" of the word would be obtained by taking 80 percent to the fourth power, yielding approximately 40 percent as the measure of regularity for the word. For a further discussion of the computation of word regularity see Venezky (1970a), and Cahen, Craun, and Johnson (1971).

Part II of the Stanford Study involved the creation of an algorithm, or set of rules, designed to produce the standard spelling of the 17,000 words on the basis of phonological cues. This was done to determine how accurately words could be spelled from oral-aural cues alone. Results were that 49 percent of the 17,000 words were spelled correctly, 37.2 percent were spelled with one error, 11.4 percent contained two errors, and 2.9 percent had three or more errors. Further, a study of the errors suggested that many misspellings would have been avoided, had the computer been programmed with simple morphological rules. For example, elementary knowledge of compounding (i.e., base morphemes are spelled independently

according to phoneme-grapheme correspondences and are combined without change) would have prevented errors like plaground for playground.

Morphological rules, Hanna et al. point out, add to the regularity of the spelling system. For example, the past tense morpheme is always spelled ed no matter that it is pronounced 3 ways: /əd/ as in landed, /d/ as in grabbed, and /t/ as in rushed. Only 3 percent of words fall into the "demon" category and may have to be memorized rote. Even with the demons only the spelling of certain parts of the word cannot be predicted by rule. To give an example from these authors, in the word women - a 5-phoneme word - only the phoneme /ɪ/ is represented by a rare (in fact, unique) correspondence.

Based on these findings, Hanna and Hodges (1963) outlined, as given below, the principles for a school spelling program. Subsequently, the scope and sequence of such a program was set forth in more detail (Hanna and Hanna, 1971).

> A modern spelling program is possible today as a result of new research into linguistics and into teaching-learning theories. Such a modern spelling program will (1) start from the child's possession of a large aural-oral vocabulary; (2) teach him how to break these words into component sounds; (3) lead him to discover the correspondences between the phonemes and the alphabetical letters that have come to represent these sounds in standard American-English spelling; (4) help him discover the influence that position, stress and context have in the choice of a particular grapheme from among the several options; (5) guide him to go beyond the phonological analysis to examine the morphological elements such as compounding, affixation, or word families; (6) teach him how to use all his sensori-motor equipment of ear-voice-eye-hand to reinforce each other in fixing the standard spelling in his neural system; and (7) help him to build a spelling power that should make possible a writing vocabulary "unlimited" or limited only by the size of his spoken vocabulary.

Spelling series of the sixties and seventies have increasingly attempted to incorporate linguistic principles. Our review of several

recent spelling series, however, reveals that they vary a great deal. In fact, in most modern series a compromise has been struck between the two organizing principles: utility, as represented by frequency of use, and structural characteristics of words.

There have been two systematic studies of recent spelling series. Boord (1966) in a doctoral dissertation analyzed five widely used spelling series to determine the extent to which their presentation of words took advantage of the alphabetic principle and the spelling patterns of English. He found that only two of the series did so to any extent, and even these two were not consistent.

Cronnell (1971b) analyzed six commercial spelling programs. Although a "common core" of content was found in all of the series, there was noted a considerable amount of variation in linguistic orientation, in the accuracy of the generalizations included, in the selection and ordering of material, in the number of sound-to-spelling correspondences taught, in the manner of handling exceptional words, and in method of teaching. Some programs favor an inductive, others a more deductive approach.

Venezky (1970a) has carried out the most complete analysis to date of English orthography. He wrote a computer program to derive and tabulate the correspondences from the standpoint of reading (from spelling to sound) in a 20,000 word corpus. Rejecting the idea that the orthography is an imperfect system with numerous departures from the phonemic principle, Venezky rather describes it as "...not merely a letter-to-sound system riddled with imperfections, but instead, a more complex and more regular relationship wherein phoneme and morpheme share leading roles." In addition, Venezky developed a model for describing these relationships.

The following excerpt from an article written by Venezky for the NSSE Yearbook (1970b) gives some idea of the implications of his findings for teaching:

BASIC UNITS

The letters (graphemes) used to spell English comprise the 26 letters of the Roman alphabet. The units which must be manipulated to relate sound to spelling, however, are not just the letters, but various letter combinations which function as single units, such as th, ck, tch, oo, and ou; all of these together are called spelling units. The most important spelling units are shown in Table 1.

The need for the classification spelling unit is best exemplified by the final e rule for single letter vowel spellings. If this rule is stated as follows: "A long vowel sound can be spelled by a single letter vowel, followed by a single consonant letter, and then a silent e," words like axe, bathe, and writhe appear to be exceptions. This pattern, however, is not based upon letters, but upon spelling units. The vowel spelling can be followed by a simple consonant spelling unit plus silent e. Complex spelling units--x, dg, tch, ck--either stand for two sounds (x) or are replacements for doubled consonants (dg, tch, ck). Spellings like th, ch, sh, and ph are simple spelling units since long vowel sounds can be spelled with single vowel letters standing before them (e.g., bathe, cochineal, kosher, hyphen); long vowel sounds can never be spelled with single vowel letters before the complex consonant units.

TABLE 1

THE MAJOR SPELLING UNITS

Consonant Units				Vowel Units		
Simple			Complex	Primary	Compound	
b	k	s	ck	a	ai/ay	oa
c	l	sh	dg	e	au/aw	oe
ch	m	t	tch	i	ea	oi/oy
d	n	th	x	o	ee	oo
f	p	u		u	ei/ey	ou/ow
g	ph	v		y	eu/ew	ue
gh	q	w			ie	ui
h	r	wh				
j	rh	y				
		z				

RELATIONAL UNITS AND MARKERS

> Another feature of English orthography which current linguistic research has clarified is the distinction between relational units and markers. Relational units are those spelling units which relate directly to sound; markers are letters which indicate spelling-sound relationships, or preserve graphemic or morphemic patterns. Final e is a marker in mate since it indicates the long pronunciation of a. It is a dual marker in rage, indicating the pronunciations of both a and g (compare rag). In love, e preserves a pattern which forbids v to occur in final position. In mouse, house, and moose it indicates that the s is not a morphemic unit, that is, is not a plural or third singular indicator. In guide and guest, u is a marker, showing the /g/ pronunciation of g. All of these patterns relate as much to spelling as to reading; it is the task of the educator to decide if they can aid in the teaching of spelling, and if so, how.

Venezky was working from the standpoint of reading and cautions that spelling cannot be accomplished through a simple reversal of spelling-to-sound patterns. He offers the following pedagogic application of his work for spelling instruction (1970b).

First, he suggests that the classification "regular" and "irregular" is too simple to describe English spelling and recommends instead for spelling instruction a three part classification of spelling patterns as (1) predictable, (2) unpredictable but frequent and (3) unpredictable and rare. He discusses the implications of this classification as follows:

> The value of this tripart classification is that it separates spelling patterns according to the behaviors which we would expect good spellers to acquire. Predictable patterns, while they may require a concern for environment, are transferable to any word containing the sounds involved. Variant-predictable patterns require attention to such features as position, stress, or following sounds, but can still be transferred once the appropriate features are known. Unpredictable patterns cannot be transferred to new occurences of the same sounds, but while one anticipates seeing certain frequent, unpredictable patterns in new words, one does not expect to see the rare, unpredictable patterns there. The difference between the two classes is, then, that the first occurs in an open-ended set of words and the second occurs in a closed set.

Venezky's classification has been incorporated into one modern spelling series (Day and Lightbody, 1970) with transfer words presented on a green background and grouped according to a correspondence which can be transferred when the sound occurs in another word, e.g., the short a sound is always spelled a. Words containing unpredictable but frequent correspondences, e.g., right, night, bright, etc. appear on a yellow background, while words with rare and unpredictable correspondences, e.g., once, are on a red background.

Other modern linguistic programs (e.g., Hanna, Hanna, Hodges, Peterson and Rudorf, 1970) follow the two-part classification of regular and irregular, with separate study techniques for the two types of words. Irregular words are taught through visual and hand learning, while with the regular words the child relies more on matching sounds and letters.

What we are seeing, then, is that one best way to teach spelling may not exist. Different kinds of words may require different learning (and teaching) strategies. Further, what should be apparent is that the generalization controversy is based on a simplistic notion of the English spelling system. True, there is limited correspondence between sounds and spelling when viewed from a naive one-to-one perspective. But in the light of analyses such as Venezky's, the phonology and orthography are seen to be closely related, and in addition, morphological principles add to the regularity of the system. In fact, the morphology is a highly dependable source of spelling knowledge. For example, prefixes and suffixes, inflectional and derivational, are added to roots by fixed and dependable rules.

There are words, however, where neither the phonology nor the morphology provides the speller with enough information. Homophones--words pronounced exactly the same but with variant spelling are the extreme case--

and here syntax and semantics enter the picture, e.g., "I want two cupcakes too." To determine the correct spelling here, the child needs to have a strong working relationship with these other levels of languages.

Personke (1973) points out, in addition, how some knowledge of etymology can be useful to the child in other instances where the phonology provides no clue. For example, /S/ is spelled c in words having to do with hundred: cent, century, centimeter, percent, centipede, etc.

Venezky's analysis, as noted, was carried out from the standpoint of reading, and proceeded in the direction of spelling-to-sound. A similarly thorough and extensive analysis including morphological rules has not been carried out for spelling. Russell (1975), however, has analyzed a smaller word sample to define the phonological and morphological principles governing the orthography from the standpoint of spelling. On the basis of her analysis she states, "Generally, sound-to-spelling correspondences are predictive of the spellings of individual base morphemes, and derived words are spelled according to morphological principles." She outlines the principles as applied to (1) monosyllabic monomorphemic words, (2) polysyllabic monomorphemic words, (3) prefixed words, (4) suffixed words, (5) compound words and (6) foreign words.

Russell points out that the purpose of her analysis was not to define "spelling rules" to be used in teaching spelling. She notes, however, that "...good spellers have a tacit knowledge of the principles delineated here, just as good speakers have a tacit knowledge of the principles of English grammar."

Research on Other Issues in Spelling Instruction

There are other issues concerning spelling methodology which have

been given attention by researchers in spelling instruction. Some of these will be briefly reviewed.

The Incidental-Systematic Controversy

Since the turn of the century, there has been a controversy about whether spelling should be systematically taught as a separate subject or whether it is better learned incidentally through other subject areas, as the need arises in children's writing. Bennett (1967) gives an account of research carried out by Cornman in 1897 to answer this question. In Cornman's study, spelling instruction was dropped altogether for three years in two schools and spelling achievement compared with that of other schools which had continued regular spelling classes. Results were that spelling of pupils who had received no systematic instruction was inferior to the other students on a list-type test, but differences were "startlingly small." On an essay-type test, spelling achievement was found to be "virtually unaffected" by the three-year suspension of instruction.

Peters, however, in her book, Spelling: Caught or Taught? (1967) strongly supports the systematic teaching of spelling. She summarizes the findings from research as follows:

> (a) Not all children need formal spelling lessons, though the competence of any such children in spelling must be regularly tested.
>
> (b) Children are likely to learn how to spell (catch) only about 4% of the words they read.
>
> (c) "Catching" words incidentally seems to occur when children's attention is centered on some object other than improving the skill itself.
>
> (d) The casual experience of words in reading lessons is, in the case of young and backward children, insufficient for recording permanent impressions.

> (e) College students' spelling improves by reading, particularly of words brought to their attention. Better spellers learn more new words through reading than poor spellers. (Peters, 1970)

E. Horn (1960), writing on the contribution of reading to spelling, notes that students do learn to spell many words through reading, and correlations between reading and spelling are relatively high, but for many children (especially poor spellers) more is required to fix a word in mind than encountering it incidentally in reading. As evidence for the systematic teaching of spelling, Horn cites Fitzgerald (1951, 1952) that most of the hundred words which are most frequently misspelled, are among the 1,000 most frequent words in reading. Thus reading a word repeatedly doesn't guarantee knowledge of its spelling.

Presentation of Words - Context Versus List

Another issue which has been studied is whether words for a spelling lesson are better presented in the context of a story or in list form. Considerable early research indicates the superiority of list presentation (Hawley and Gallup, 1922; McKee, 1924; E. Horn, 1944). From their research reviews, E. Horn (1960) and T. Horn (1969) conclude that this principle is firmly established, and further that it is unnecessarily arbitrary to teach the meaning of each word or to require students to write dictionary definitions.

A few studies, however (Hahn, 1960; Smith, 1975) indicate that contextual presentation is at least as effective as list presentation.

Test-Study-Test Versus Study-Test

Another issue that has interested educational researchers is the comparative effectiveness of having children study their spelling words

before being tested or beginning the week's instruction with a pretest. The obvious advantage of the latter procedure is that it identifies for the student the particular words he needs to study. The test-study-test procedure, however, is generally not suitable for a linguistic approach, where the student may be given word-study exercises to lead him to a generalization. For example, he may be presented with a list of words where the long a sound is spelled ai or ay, and there may be sorting exercises and questions leading him to the realization that ai occurs at the beginning or in the middle of a word and ay at the end. For the list learning method, however, test-study-test has been found to be more effective than study-test for all but the youngest children (Gates, 1931). T. Horn (1947) carried out a much-cited study on this question and concluded that the corrected test alone contributed from 90 to 95 percent of achievement, and for the upper third of a class was sufficient for mastery or near mastery.

Schoephoerster (1962) compared some variations of the Monday pretest--Friday post-test routine with three ability groups. He found that while above-average spellers did well with any of the plans, average spellers improved if a mid-week test was also given, and low-ability students required, in addition, daily word-study exercises. This finding appears to bear out Peters' (1967) contention that while "linguistically favored" children may to a large extent teach themselves to spell, the low-aptitude student needs much practice.

Related to the corrected test procedure is a study of Blumberg and Block (1975) which evaluated the effects on learning new words of having students attempt to spell a word before they see it. They found that attempting spelling before seeing the words facilitated acquisition

but did not influence retention at two and six weeks following training.

Distributed Versus Mass Learning

Distributed rather than mass learning with periodic review is recommended by spelling authorities, although the most efficient scheduling of reviews has not been adequately researched. (E. Horn, 1960).

A study by Rieth, Axelrod, Anderson, Hathaway, Wood and Fitzgerald (1974) used behavior analysis methodology to determine the influence of distributed practice and daily testing on spelling scores. They found that students did better when given only a portion of the week's words each day, with daily testing. (This is contrary to the common classroom procedure of giving out the entire weekly spelling list of 20 or so words on Monday, and testing on Friday). Rieth et al. found that while with good spellers it made little difference which procedure was followed, poorer spellers performed significantly better when given five or six words a day with daily testing.

Number of Words to be Studied in a Lesson

While there has been considerable research on the size of the total spelling vocabulary an elementary school child needs to acquire, there has been practically no attention given to the matter of the number of words to be studied in individual lessons. Rieth's study described above appears to be the first to be concerned with this question.

Most spelling programs recommend 15 to 20 words per week in the lower elementary grades and 20 or more in the upper grades. Not much attention has been given, however, to the problem of the poor speller who cannot handle such a large number of words. Regarding this problem T. Horn (1969)

states that seriously retarded spellers should have attention given to their underlying disability and should be "accommodated through...a reduction in the number of words to be studied."

The corrected Monday pretest has been looked upon as a boon to the good speller, who is thereby relieved of the burden of wasting time studying words he already knows (Christine and Hollingsworth, 1966). Curiously, the plight of the poor speller under this procedure seems to have gone virtually unnoticed. While the good speller may already know many of the words on the Monday list and have a few new words to master, the poor speller is apt to know few or none, and consequently will have an impossible number of words to struggle with.

Methods of Word Study

T. Horn (1969) writes that learning experiences which involve all imagery types are most fruitful in studying spelling words. The Horn study steps, previously mentioned, are said to use all imagery types--visual, auditory and kinesthetic. These steps require the student to (1) look at the word, (2) pronounce the word, (3) say the letter names, (4) recall how the word looks with eyes closed, (5) look back at the word and check, (6) write the word, (7) check, (8) repeat steps if necessary.

It should be noted that auditory input in this method means pronouncing the word and saying the letter names. It has nothing to do with analyzing the word into its component sounds and matching sounds and letters.

The benefit of emphasizing one input modality over the others in studying words has been evaluated by a number of researchers (Rea, 1958; Schroeder, 1968). All found no significant difference in spelling achieve-

ment regardless of the mode of input emphasized.

The notion that the individual child may have a preferred modality for learning which should be catered to is also encountered in the literature. The Gates-Russell diagnostic test (1940) attempts to determine the child's individual preference so that his strengths can be exploited. This test, of course, is intended for the child who has a problem with spelling.

Also, the idea of improving spelling through training visual perception or imagery has received attention. Gilbert and Gilbert (1942) studied eye movements in learning spelling and reported the possibility of decreasing perceptual time while increasing proficiency in visual analysis.

Radaker (1963) in a frequently cited study designed to measure the effects of visual imagery training on spelling performance, reports that fourth graders given as little as two forty-five minute training sessions in visual imagery over a two week period in December showed a significant improvement in spelling achievement the following April as compared to spelling achievement scores of the previous April. Such quick and easy results give rise to skepticism, and the length of time for uncontrolled variables to creep in should be noted. Analysis of Radaker's results reveals that the experimental groups made only the expected one year's gain, and the controls, curiously, gained only a half year over the year's period.

Focusing on the Difficult Parts of Words

Gates (1937) carried out research to determine characteristics of children's errors in 3,876 words. He found that many words had a single spot in which more than half the errors occurred. Few errors on the same words, however, were made by more than half the children, and it was

concluded that calling attention to difficult spots would be a waste of time.

Jensen (1962) looked at the relative frequencies of spelling errors as a function of position in the word. He found that spelling errors approximate the skewed bow-shaped serial position curve found for errors in serial rote learning. The obvious educational implication is perhaps that attention should be focused on the middle of words. Jensen's work, however, was criticized on the grounds that he emphasized the position effect rather than the fact that difficult spelling elements tend to occur in the middle of words.

Kooi, Schutz and Baker (1965) designed research to test this criticism. They found that most spelling errors occur at phonetically difficult parts of words, but the rest tend to fall under the serial position curve.

Jass and Gillooly (1971) further investigated this question. Separating words into "regular" and "irregular", they found that errors for regular words conformed to the serial position curve, but those for irregular words did not.

As intriguing as these findings may be, no advantage has been found for stressing hard spots, or marking out missed letters and writing in the correct ones (Hall, 1964).

Remedial Spelling Instruction

Before we turn to a review of the few studies which exist on teaching spelling to learning disabled children and to a discussion of remedial methods, a useful first step might be to consider what it is children are learning when they learn to spell, since spelling is so difficult for many

of the learning disabled.

What Children are Learning When They Learn to Spell

When children learn to spell, we know they are not simply memorizing arbitrary sequences of letters; neither are they memorizing words by the shape of the configuration or as photo-images to be stored in template fashion. There are several kinds of evidence that argue against such a simplistic visual memory explanation of spelling ability.

First, good spellers can spell from dictation nonsense words they have never seen before, which must mean they have learned the sound-symbol correspondence rules for translating from spoken to written language. The nature of the rule system they learn is becoming clearer from modern linguistic studies, although the way in which children acquire such knowledge has only begun to be studied.

There is, however, evidence which suggests that the ability to deal with regularly patterned nonsense syllables is important to spelling. Aaron (1959), in a study to determine the relationship of selected skills and abilities to spelling achievement in fourth and eigth grade children, found that "By far the greatest contribution to the estimate of spelling achievement at both fourth and eighth grade levels came from the spelling of phonetic syllables test."

Newton (1960) tested the relationship of 17 factors to spelling achievement at the sixth grade level. She found spelling phonetic syllables to be the greatest contributor, second only to verbal intelligence.

Russell (1958) in an analysis of auditory factors in spelling ability concluded that, "rather complex auditory abilities involving sound recognition in various parts of the words are more closely related to spelling

ability than is recognition of whole words as in a same-different or rhyming test."

A second kind of evidence comes from research on the acquisition of spelling patterns in the field of reading, and more recently in spelling. The importance to reading of knowledge of these patterns has been demonstrated by studies showing that nonsense words tachistoscopically presented are more accurately perceived if they follow English spelling patterns than if they violate the rule system (Gibson, Pick, Osser and Hammond, 1962; Gibson, Schurcliff and Yonas, 1970). Other studies have indicated developmental changes in children's ability to abstract and make use of knowledge of the internal structure of words (Gibson, Osser and Pick, 1963; Rosinski and Wheeler, 1971; Golinkoff, 1974). Acquisition of specific letter-sound patterns in reading has been studied by Calfee, Venezky and Chapman (1969) and Venezky, Chapman and Calfee (1972).

There are several such studies related to spelling. Wallach (1963) compared good and poor spellers on ease of recognition of nonsense words which follow English spelling patterns and those which do not. When groups were equated for accuracy of recognition of the latter type of words, good spellers were found to be superior to poor spellers in recognition of the patterned nonwords.

McLeod (1967) compared fourth grade good and poor spellers on the ability to reproduce letter sequences tachistoscopically presented. The sequences were constructed to have different orders of approximation to English spelling. Good spellers were found to be superior to poor spellers on this task, and the difference between the groups increased as the letter sequences more closely approximated English spelling patterns.

Moretz (1971) examined third and fifth grade pupils' awareness of certain graphemic options used to represent selected phonemes and found a significant relationship between such knowledge and both reading and spelling achievement.

Following Moretz, M. Cheek (1972) carried out a study to determine sixth and eigth graders' knowledge of graphemic options and the relationship of this knowledge to both reading accuracy and spelling. She concluded that knowledge of graphemic options is developmental and is significantly related to both reading and spelling achievement.

Schwartz (1975, 1977) carried out a developmental study of children's knowledge of spelling patterns at each grade level from two to five. She studied the ability of children to abstract and encode two types of patterns based on Venezky's analysis: (1) orthographic patterns, such as the alternation of single and double consonants to mark the quality of the preceding vowel, e.g., coma versus comma and (2) morphological patterns, such as the formation of the plural or past tense. On spelling nonsense and real words exemplifying these patterns, good spellers were about two years ahead of poor spellers in pattern acquisition. Both groups, however, showed clear developmental trends. The groups also differed as to the type of pattern they found more difficult. On the nonsense words, good spellers performed better on orthographic than morphological patterns. The reverse was true for the poor spellers.

Frost (1973) carried out a linguistic analysis of the development of competence in spelling. He studied spelling errors of groups of children at grades two, four, six, nine, and twelve to determine knowledge of 60 linguistic relationships over five linguistic areas: (1) phonological,

(2) graphemic, (3) submorphemic, (4) bound morphemic, and (5) word level. He found a "gradual and progressive trend in the linguistic store," with some knowledge not acquired until high school. Further, development was found not to be dependent on knowledge of any single set of relationships, i.e., phonic knowledge versus orthographic rules. Frost suggests the linguistic framework used in the study might be the basis for sequencing instruction in spelling.

The third kind of evidence that learning to spell is more than visual imagery learning is that spelling errors typically do not reflect visual confusions based on configuration of words that look alike. People don't write these for there, though these words look alike, while their for there (sound alikes) is a frequent spelling error (Hotpf, cited by Frith, "Reading by Eye and Writing by Ear", unpublished paper, 1977).

Among children, an error like fite for fight is the most common type of error. In fact, three-fourths of the errors of literate adults and of most children, especially good and average spellers, are reasonable phonetic equivalents of the word (Simon, 1976).

This reliance on the sound pattern of the word has been observed as a major strategy used by normal children learning new spelling words. For example, Blumberg and Block (1975) describe how children will even invent a phonetic pronunciation to regularize phoneme-grapheme relations, e.g., dis-kī-plīne for discipline, in order to fix a word's spelling in memory.

In considering what it is children do learn when they learn to spell, a simple exercise in learning a new spelling word can be informative. If asked to learn the spelling of the word hpuoitaopspm, most people would find it a difficult assignment because the lack of conformity to English spelling patterns places too great a burden on rote memory. However, if

these same letters are reordered to form the word hippopotamus or even potpohipamus the task becomes more reasonable. There are now five manageable bits (hip-po-pot-a-mus) which correspond to the sequence of syllables in the spoken word, and this is a powerful mnemonic which greatly reduces the burden on rote memory, especially since there are also, within each syllable, phonemes to match the letters to /h,ɪ,p/---h-i-p.

Obviously, every detail of the spelling is not assured by this matching of the letter pattern to the sound pattern. If one spelled blindly by sound, the vowels in the unaccented syllables might be missed, and there might be an error with doubling. But the framework which the phonology provides - the sequence of sounds as we say and hear the word syllable by syllable - even the sequence of movements of the speech muscles as we articulate the word - hip-po-pot-a-mus - this framework is basic to fixing in memory the visual sequence of letters which spell the word.

Experience as a remedial teacher with children who misspell or misread, for example, turkey as trucky, strongly suggests that visual tracking exercises do not remedy the problem. The student must understand that the word has two syllables, tur-key, that the first syllable is /tɝ/, and that the /t/ is spelled t and the /ɝ/ is spelled u-r. With children who have a reading or spelling disability, letters seem to become unscrambled and ordered as they are matched to the sequence of sounds in the spoken word.

How to match the spelling to the sounds of English is often complex. There is, however, a simple, sequential level, and many words, mostly short-vowel words, can be spelled in simple one-to-one sequential fashion, /s,p,l,æ,ʃ/---s-p-l-a-sh. There are really no choices to confuse things in spelling such a word, and at this level spelling is, to a large extent, the simple reverse of reading.

At a somewhat harder level, there are conditional rules for this matching depending on the position of the sound in the syllable or on letters that precede or follow. For example, spelling the phoneme /k/ is complex, yet rule-governed.

Spelling the long vowels is probably the most complex aspect of English spelling. None is spelled one-to-one, but positional rules do help. For example, long a at the end of a syllable other than the last syllable is spelled with the letter a 95 percent of the time as in paper, baby, vacation, etc. (Recall that the school master of Colonial times took advantage of this regularity by teaching the children from the beginning the two basic syllable patterns: closed syllables-- a-b, ab; and open syllables-- b-a, ba). At the end of a word, long a is generally spelled ay as in play. But long a at the beginning or in the middle of a syllable may be spelled with either of 2 markers: with an i after the a as in pain or with a silent e after the final consonant as in pane.

Choice of the right spelling where there are such options or where correspondences are very irregular involves pure rote learning. An association has to be formed between a particular spelling and the meaning of the word. Note that the sound frame still helps. In the word pain only the spelling of one sound has to be learned rote.

The phonology then provides the lion's share of information to reduce the burden on rote memory, but there is also reliable, rule-governed information from syntax and morphology, as we saw in the example for spelling the past tense morpheme. It helps a great deal to know the rules for adding suffixes to root words, because these rules are reliable and have few exceptions.

There are other kinds of spelling knowledge that help in a limited

way. The silent g in the word sign is reasonable and perhaps memorable if the related word signal is known where the g is pronounced. It may help to remember that the /s/ in electricity is spelled with a soft c if one knows the related word electric. Awareness of such lexically related words proves to be of only marginal benefit, however, for disabled spellers, since their problems are generally at a much more basic level than the predominantly Latinate segment of the vocabulary where such related words are most commonly found (C. Chomsky, 1970; Steinberg, 1972).

To summarize, what children are learning when they learn to spell is a great deal about the structure of the language. They are relating the orthographic form of the word - that is, its spelling to 1) the word's phonological form - the way it sounds and is pronounced, and 2) to the word's syntactic and morphological form - the way it is typically used in a sentence and the units of meaning in the word, e.g., landed has two morphemes, and 3) to its semantic form - what the word means. To the extent the speller can match the spelling to information from the phonology and morphology, to that extent he does not have to rely on learning rote the association of an arbitrary string of letters with the semantic form.*

Spelling knowledge, then, is a mix of 1) helpful information about the relation of the spelling and pronunciation patterns of the word and 2) rote knowledge specific to the particular word. Children with a spelling disability are handicapped in the ability to take advantage of this helpful information, especially from the phonology, so that the burden on rote memory becomes excessive.

*This conceptualization of the nature of the task in acquiring spelling knowledge borrows from Ehri's amalgamation theory of word recognition (Ehri, 1978).

Types of Spelling Disability

There have been a number of attempts to delineate subtypes of dyslexia. Based on work with acquired dyslexia in adults, Kinsbourne and Warrington (1966) have described a language retardation group with lower verbal than performance IQ and other manifestations of weakness in the language area, and a Gerstmann group, with lower performance than verbal IQ, and characterized by finger agnosia. The spelling errors of the two groups are said to differ, with the first group making more phonetically inaccurate errors and the second group making more order errors, as well as errors of extraneous letters.

Bannatyne (1966, 1971) has distinguished genetic dyslexia and minimal brain dysfunction dyslexia. The first group represents the lower end of the normal distribution of verbal ability and shows weakness in certain auditory functions (discrimination, sequencing, and sound-symbol association) while the second group shows dysfunction in a wider area including visuo-spatial, motor-kinesthetic, tactile-integrative and conceptual.

Johnson and Myklebust (1967) made a distinction between auditory and visual dyslexia as manifesting deficits in either central auditory or visual processes. Boder (1970, 1971, 1973) has also defined subtypes of dyslexia having primarily visual or auditory deficits. Her diagnosis is based on the abnormal reading and spelling patterns of these children. Of 107 dyslexics age 8 to 16 seen for evaluation at a clinic (all of whom had spelling as well as reading problems) 63 percent were classified as Dysphonetic because of their inability to decipher unknown words in reading or to write reasonable phonetic equivalents of unknown words in spelling. Nine percent were categorized as Dyseidetic, Boder's term for

a subgroup said to be characterized by a primary deficit in the ability to perceive words as visual gestalts. Although this group could sound out words, reading was slow and halting. A mixed group (22 percent), which contained the most severely retarded readers, shared with the Dysphonetics the inability to write reasonable phonetic equivalents of unknown words in spelling.

Reinterpretation of Boder's data reveals that 85 percent of the children seen (91 percent of those classifiable) had a similar deficiency in that they were not able to spell phonetic words, i.e., they had difficulty in using information from the phonology. Since almost the entire group is characterized by a similar deficiency, this suggests the problem these children face is basically the same. It would appear that the Dyseidetics, though able to spell phonetically and to sound out words in reading, did so very slowly and inefficiently. Thus, they too can be seen as somewhat handicapped (though less so than the Dysphonetics) in the ability to take advantage of information from the phonology.

Boder presents a sample of the spelling of a Dysphonetic 15-year-old boy with a fourth grade sight vocabulary in reading. "Known words" are those which had been recognized in reading. "Unknown words" were selected from vocabularly up to two years above the reading level. Note that the initial letter in each word is correct. This is the usual pattern with severe spelling problems and would appear to indicate that this boy's problem is not primarily lack of knowledge of individual correspondences.

The sample from Boder is reproduced below.

Richard Age - 15 Grade - 10

KNOWN WORDS		UNKNOWN WORDS	
1. farer	(farther)	1. refet	(rough)
2 rember	(remember)	2 cbetere	(characters)
3 study	o	3 sher	(scholar)
4 humbn	(human)	4 deter	(doubt)
5 beever	(believe)	5 interver	(inventor)
6 should	c	6 mar	(marmalade)
7 dilit	(delight)	7 slebee	(scrambled)
8 cattegt	(cottage)	8 uer	(varnish)

Source: Figure 1, Boder, E. 1973, page 669

Avakian-Whitaker and Whitaker (1973) analyzed the spelling errors of 40 children with severe communication disorders and found, similarly, that although the spelling of this group was in general grossly deficient, the consistency of word-initial approximations to the target word was impressive. The major problem with both groups would then appear to be an inability to segment words into phonemes and to make use of the phonemic structure to order the succession of letters in spelling.

Experience as a remedial teacher indicates that in general it is helpful to think in terms of two levels of spelling disability, which differ primarily on the dimension of the severity of the spelling problem. Our most severely disabled spellers (who inevitably have a reading problem as well) are handicapped in the basic ability to take advantage of information from the phonology because of serious difficulty with phonemic

analysis (and synthesis).*

Without specialized remedial help this group often cannot cope with the simplest phonetic spelling, and their spelling errors reflect their deficit in dealing with the sound pattern of words. They may omit phonemes or entire syllables, or make non-phonetic substitutions, as well as transpositions and reversals. In its extreme, the spelling of this group has been characterized as "bizarre." They must have help in acquiring a basis of phonetic spelling through a carefully sequenced remedial program that goes "back to scratch", if necessary.

Less severely disabled spellers (who generally are better readers), though not very facile with phonemic analysis, can handle simple phonetic spelling. They have difficulty, however, with the more complex orthographic rules, in applying linguistic generalizations, and in dealing with graphemic options. This second group is characterized by "better" spelling errors, i.e., they are generally able to write a fairly reasonable phonetic equivalent of the word. They usually require a different type of program remedially, with attention to higher-level spelling rules and work with specific difficulties, such as spelling the vowels in unaccented syllables, or practice with common irregularly spelled endings, etc.

Research on Teaching Spelling to Learning Disabled Children

Haughton (1975) reports on a comparative study with normal and learning disabled children of the effects on spelling achievement of teaching to the preferred modality, as identified by the Illinois Test of Psycholinguistic Abilities (Kirk, McCarthy and Kirk, 1968). Subjects were 32 third

*See Liberman, Shankweiler, Liberman, Fowler, and Fischer (1977) for a discussion of the importance of phonemic analysis to the acquisition of basic reading skills.

and fourth grade students. Results indicated that teaching to the preferred modality made no significant difference on spelling scores.

Hill (1973) carried out a study with 16 low-achieving children with "unspecified learning disabilities" in grades four and five of an urban, low income school to evaluate the effectiveness of an individualized, self-paced spelling program which emphasized a visual-kinesthetic-tactile approach to learning spelling words. The number of words learned during the six weeks of the experiment was compared with the number learned by the same group during the six week period prior to the experiment. Hill reports that a significantly greater number of words was learned in the experimental period, with an 84 percent retention rate on retesting one to six weeks later.

Lovitt (1975), who has been using applied behavior analysis in curriculum research with learning disabled children, reports informally on spelling investigations carried out or in progress in the Curriculum Research Classroom at the Experimental Education Unit of the University of Washington. He discusses briefly several spelling studies concerning the effects of grouping of words and development of spelling generalizations. Findings are inconclusive and point out the need for research on various word grouping strategies--by frequency of usage, by length, according to a phonics generalization, or by context, etc. Lovitt states this is a practical question which should be researched, since all spelling texts group words in one fashion or another.

Remedial Approaches to Teaching Spelling

What follows is a description, in some detail, of a number of remedial programs used in actual practice which have helped children learn to spell.

Two of the best-known remedial approaches to spelling, Orton-Gillingham (Gillingham and Stillman, 1960) and Fernald (1943) emphasize a multisensory approach. There are points of similarity between them but differences also, as will be discussed. The work of several people working in the Orton-Gillingham tradition will also be described. In addition, programs relying on task analysis and criterion-referenced tests will be covered, as well as specific suggestions from the LD literature on teaching spelling.

Orton-Gillingham

Gillingham and Stillman (1960) working under the direction of Dr. Orton (1937, 1966) developed a program for the coordinated teaching of reading and spelling to dyslexic children. Their method follows closely the two basic principles laid down by Dr. Orton for the instruction of these children (cited by Schiffman, 1964):

(1) Start language training with small units which the pupil can handle easily and then proceed by orderly steps from the simple to the more complex.

(2) Use all sensory pathways to reinforce the weak memory patterns and to strengthen one another. For example, have the pupil look at the letter, hear or say its sound, and trace it simultaneously.

From these principles was developed a system of remedial instruction which emphasized (1) learning individual letter-sound correspondences by building associations between visual, auditory, and kinesthetic impressions, (2) fusing, or blending the sounds to form words in reading, with simultaneous tracing or writing, and (3) careful selection and sequencing of words taught. Words introduced initially are only those which have consistent

sound-symbol correspondences, both for reading and spelling. Spelling is thus treated as the exact reverse of reading. Along with one-syllable words, the child is given experience reading and spelling detached syllables, also regularly spelled. When polysyllabic words are introduced, they are learned syllable by syllable, e.g., Sep tem ber. Only gradually is the child exposed to words whose spelling is not entirely consistent, and here also the sequence is orderly. Sounds with optional spellings are taught as such, with words following a pattern grouped for ease of learning. Inflectional endings, prefixes and suffixes are taught by the rule with emphasis on verbalization and application. Only sparingly are very irregular words taught until the child has mastered the basics. According to Gillingham, "Much trouble would be prevented if poor spellers were made automatically secure in spelling phonetic words before they face ambiguous spellings" (p. 119).

The technique followed in studying spelling words is called SOS (simultaneous oral spelling), whereby the child pronounces the word carefully, spells it orally, then writes the word, simultaneously saying the letter names as he writes. Letter names, not sounds, are used in this practice so that the same technique may be applied later to nonphonetic words.

The child checks his own spelling errors by reading aloud what he has written, and extra reinforcement is provided through dictation--words, phrases, sentences--with the child carefully repeating what has been dictated before writing.

Fernald

Fernald (1943), taking her inspiration from Montessori, also developed a multisensory approach, with much tracing and writing for word learning.

Fernald differs from Gillingham in two major respects: (1) Words to be learned are of the child's own choosing, as he needs them for his own writing. No attempt is made to sequence words according to structural characteristics and (2) Instruction focuses on whole words, not individual letters and sounds.

Fernald lists the following steps as important in learning spelling: (1) clear perception of word form, (2) development of a distinct visual image of the word, and (3) habit formation--repetition of writing until the motor pattern is automatic.

While the steps stated above stress visual and kinesthetic-motor factors, the procedure Fernald outlines for actually teaching spelling gives attention to auditory and articulation factors as well. She specifies careful pronunciation, with each syllable of the word dragged out slowly as it is traced or written. The emphasis she places on careful articulation is apparent in her recommendation that children with speech defects be worked with in private so as not to embarrass them.

Fernald's study steps are as follows: (1) The child says the word slowly while looking at it. (2) The teacher (or child) underlines the syllables as the child says the word slowly. (3) The child again pronounces the word slowly, writing each syllable as he says it. (4) The child writes the word from memory on the back of his paper. Words are never copied, which would defeat the purpose of developing recall, but are written from memory and their use encouraged in the child's written expression.

If the child is unable to learn through sounding and writing, then finger-tracing is used, with the word written large in crayon. The child traces with his finger while saying the word. This provides tactile input and accounts for the V-A-K-T (visual-auditory-kinesthetic-tactile) designation

of the Fernald method, as compared to Gillingham's V-A-K system.

While Fernald states that different children may use different types of imagery in learning spelling and should be allowed to use the preferred modality, she finds in practice that children who can learn spelling by a visual emphasis are few indeed.

Taschow (1970) reports on the highly effective use of the Fernald approach with elementary and secondary students with deficiencies in spelling.

Bannatyne

Bannatyne (1971) has developed a system for reading and spelling instruction and a special procedure for teaching remedial spelling which has certain features in common with both Fernald and Gillingham. He has also done research on psycholinguistic and motor functions related to spelling ability (Bannatyne and Wichiarajote, 1969). In a study of normal third graders, Bannatyne and Wichiarajote found that sound blending is a major variable in spelling. They state that, "it is very likely that the sequencing aspect of spelling is primarily determined by the vocal-motor habitual patterns involved in sound-blending, that is, the vocal-motor sequencing of articulemes" (p. 10). According to these authors, somehow the synthesis of sounds in blending words for decoding helps the child in the reverse situation of analyzing a word in inner speech into its component parts for encoding (or spelling).*

*Naidoo (1972), on the basis of a large study of dyslexics, also points to a possible underlying sequencing problem in children who are poor readers or spellers. She found that a deficit in sound blending was characteristic of the various groups of dyslexics which she studied.

Like Fernald, Bannatyne believes letter names should not be used in studying words in spelling because this interferes with the child's hearing his "phonemic vocal inner language." Like Gillingham, he believes that words of similar spelling and vowel phonemes should be taught together because they reinforce each other and permit the child to grasp the patterns of the English spelling system.

In Bannatyne's system, a spelling lesson always begins with nonvisual training in a slow and careful articulation of the word, which is pronounced as a whole and then with phonemes separated. Second is visual study of the word, and third, a careful meshing and matching of the two.

The study steps are as follows: (1) Pronounce the word carefully, e.g., "ship". (2) Pronounce the word, separating the phonemes /ʃ,ɪ,p/. (3) Study the visual word, separating graphemes to match phonemes, e.g., sh i p. (4) Articulate each phoneme as the teacher points to graphemes in sequence. (5) Write the graphemes as lightly spaced units while articulating the phonemes in rhythmic sequence. (6) Practice using this technique, with copying and tracing, if necessary, until the word is fixed in mind.

With multisyllable words, the syllable is the unit for sequencing practice. More advanced skills, such as prefixes, suffixes, and roots, are included as the pupil progresses.

Other Programs Following in the Orton Tradition

Childs (1971) describes The Childs Spelling System as an attempt to apply sound linguistic principles and the discovery technique to the area of spelling so that encoding can be substituted for rote memorization. Although this system is based on the Gillingham-Stillman system, Childs has

reorganized and simplified some of the generalizations.

The system begins with basic sound-letter correspondences, moves on to spellings with alternative probabilities, and utilizes rules when sound alone will not produce the correct spelling. Patterned words are learned in groups rather than memorized separately. Childs has set for herself the task of sequencing a 3,000 word vocabulary according to Gillingham-Stillman principles.

Slingerland (1966) has adapted the Orton-Gillingham approach for classroom use with children identified in the early grades as having a Specific Language Disability by the Slingerland Screening Test for Identifying Children with Specific Language Disabilities, Grades 1 - 4 (Slingerland, 1964). Slingerland's approach is, therefore, preventive rather than strictly remedial.

Aho (1967) has described the high degree of effectiveness of this program in action in an elementary classroom.

Spalding and Spalding (1972) have designed a program for teaching beginning reading and spelling which has also been used with remedial students in higher grades. It follows the Orton tradition of teaching individual correspondences of the phonograms, with much practice varying the mode of presentation and response (visual-auditory-kinesthetic). All words for reading are learned first through spelling. The child learns an elaborate coding system for marking words in his spelling notebook according to correspondences represented. Those taught are for decoding, however, not spelling. For example, the child learns to respond automatically to the three sounds of a when this letter is presented. For spelling words containing these correspondences, e.g., hat, late, father, the vowels are marked according to whether they represent the first, second, or third

sound of a. The child keeps a spelling notebook which organizes learned words as short vowel, "magic e", etc. and according to spelling rules. The actual words presented, however, are sequenced in terms of frequency of use, not according to spelling consistency.

Cox (1971) in his Situational Spelling has reorganized and refined the Gillingham-Stillman spelling generalizations and prepared a handbook for use as a guide by the language therapist. The word "situational" in the title refers to the fact that the spelling of a particular speech sound is often governed by its position in the word or syllable, or by its relation to adjacent letters in the word.

Remedial Programs Based on Task Analysis and Criterion-Referenced Tests

Westerman (1971) has made a task analysis of spelling skills at the cognitive, sensory-motor and basic language concept levels and has developed an order of instructional tasks beginning with single consonants, short vowels, and their combination in consonant-vowel-consonant words. The sequence proceeds to more complex correspondences, irregular word families, and morphological rules. She has prepared criterion-referenced tests for mastery of the instructional tasks in the sequential order suggested.

Westerman notes that standardized spelling tests yield limited diagnostic information unless an informal error analysis is done. She notes further that available diagnostic spelling tests assess only part of the picture. She recommends modality preference testing, not only of input, but output modalities as well.

The SIMS Reading and Spelling Program (1977) was designed for learning disability students in the Minneapolis public schools. A sequence of

concepts necessary to decode and encode effectively has been identified. Using task analysis, the concepts have been broken down into 53 subskills which have provided the categories for selecting and sequencing of vocabulary. Each of the subskills has been criterion-referenced as representing a particular word structure generalization. There are performance measures to monitor the student's progress in decoding and encoding words in each category.

An interesting feature of the SIMS program is the use of "syllable type" as an organizing concept. The concept of a closed syllable is first focused on, and in the course of the program students learn the six basic syllable types. Vowel letters are introduced one at a time and carried through all syllable types and structures in which they occur.

The GFB Perceptual Training Drills for Teaching Reading and Spelling (Gallistel, Fischer and Blackburn, 1974) is a similar carefully sequenced decoding and spelling program organized around the concept of syllable type and with criterion-referenced tests to monitor pupil progress. The Gallistel-Ellis Test of Coding Skills permits the parallel monitoring of the decoding and spelling of words of specific structural type.

Other Suggestions for Spelling Remediation

Rosner (1975), who has worked in the area of children's development of perceptual skills as related to school progress, has defined three stages of spelling. In Stage I the child is able to decode words to speech. Stage II requires the analysis of the spoken word into its sounds and the matching of sounds to letters. If the match is consistent, no memorizing is necessary--the child will be able to spell the word. If the match is not perfect, then the child needs strategies for remembering

that part of the word which is inconsistent. Stage III involves devising strategies for remembering the difficult part of the word. Suggested strategies to be developed in the children are (1) using a spelling pronunciation for that part of the word which is inconsistent, e.g., pronounce the k in knife, (2) teaching words with infrequent patterns in groups, and (3) for the small number of words which must be memorized rote, copying and writing from memory while saying the letter names aloud.

If the child fails at Stage I (if he can't decode) Rosner recommends diagnosis for possible underlying deficits in visual or auditory perception. If he fails at Stage II, then the Test of Auditory Analysis Skills (Rosner and Simon, 1971) is recommended. Appropriate activities to remediate the underlying deficits at the various stages are suggested.

Rosner points out that talking about spelling irregularities is useless with a child who can't match regular sounds. Neither, in his opinion, should a child be asked to spell words he can't decode.

Cotterell (1974, 1971) lists principles for helping children with spelling disabilities. She emphasizes the importance of taking the burden off the weak rote memory and placing it on the ability to reason, with no words which can be worked out according to an expected pattern taught rote. Long words are divided into "manageable bits" (syllables), and the child vocalizes as he writes, saying the words with syllables clearly divided to avoid syllable omissions. Teaching of the phonic structure should be systematic, with overlearning and reinforcement through writing. She notes that many bad spellers find spelling rules helpful.

Cotterell describes the use with severe spelling disability cases of the Edith Norrie Letter Case in which the letters are arranged according

to the way the spoken sound is produced--by the lips, tip of the tongue, or back of the throat, with vowels colored red, voiced consonants black, and unvoiced consonants green. To help establish the connection between speech and symbol in spelling unknown words, children look in the mirror to observe their own articulation before selecting the letters. They soon learn that every word and syllable must have at least one red letter.

Jackson (1969) describes a somewhat similar "structured alphabet" for use in teaching spelling to slow learning children.

Johnson and Myklebust (1967) recommend for remedial spelling separating words into those that are phonetic and those that are not. Their method of spelling practice includes having the student read the word as a whole, pronouncing each syllable separately, then write one syllable at a time while saying the syllable. In addition, they also have students do exercises involving writing in the missing part of a word pronounced for them syllable by syllable, after which the student writes the whole word from dictation.

Johnson and Myklebust have observed that learning disabled spellers do considerably better when words are dictated slowly, one syllable at a time. They have noticed as much as a two-year improvement in spelling performance when the rate of dictation is slowed. Other observations are that oral spelling is sometimes a help until the student learns to revisualize and that some children are helped by observing the teacher's lip movements as words are dictated. Typing is also suggested as helpful for some.

Peters (1975) has developed a diagnostic spelling test and offers suggestions for remediation based on an analysis of the child's errors,

which are categorized as (1) reasonable phonic alternatives, (2) phonic alternatives not conforming to spelling precedent, and (3) unclassifiable errors (random errors). For example, if the word to be written is tied, tide or tighed would be errors of the first type; tarhd the second type; and col the third type.

If unclassifiable errors are frequent, Peters recommends a structured remedial program. If the child substitutes according to spelling precedent, the prognosis is good. If substitutions are phonic but not according to spelling precedent, the child's attention should be focused on word structure, and on likenesses and differences between words so that he can learn common spelling patterns.

Miles (1970) gives practical suggestions for helping dyslexic children with reading and spelling by means of a phonetic cues method of teaching children to combine letters correctly.

Arena (1968) has compiled a group of articles, many from Academic Therapy Quarterly, which discuss a wide variety of methods and materials for teaching spelling to the learning disabled, along with creative ideas from classroom teachers on teaching spelling.

Lamond (1971) presents a method of teaching remedial reading and spelling which emphasizes cultivating listening ability and reasoning out the way words are spelled.

Jacobson (1971) outlines a technique which makes concrete for learning disabled children the process of adding inflectional endings to base words.

Consilia (1977) discusses a procedure which develops the student's ability to spell inflectional and derived words by starting with known root words from the student's sight vocabulary.

Summary and Conclusions

The spelling problem among learning disabled children is both extensive and difficult to remediate. It is almost always worse than the reading problem in dyslexics. Reasons why spelling might be harder than reading were explored and a historical sketch of spelling instruction carried out to identify past approaches and methodological issues which might shed light on the question of how spelling could best be taught to children who have difficulty learning it.

In Colonial times and throughout most of the nineteenth century, reading and spelling were taught as coordinated subjects. After they knew the alphabet, children learned to read by spelling, beginning with 2-letter syllables, then 3-letter words, etc. which were taught through drill in spelling aloud the syllables, pronouncing them, and writing them on their slates. The guiding principle of all the early spellers was that of proceeding from simple to complex with respect to the number of letters and syllables in the words.

With the changeover to the whole word method of reading instruction, spelling was no longer the handmaiden of reading, and it came to assume a subordinate role, losing prestige and emphasis as a school subject. By the 1930's spelling programs were sequencing words for spelling instruction according to the frequency principle, with words of highest frequency taught first. The result was that children were given very early many irregular words to learn rather than being exposed to a carefully sequenced linguistic sample which would facilitate the abstraction of phoneme-grapheme correspondence rules.

A major controversy in spelling instruction since the early 1900's has been the question of whether English orthography is sufficiently regular so that spelling programs should be designed to take advantage of the rules and regularities or whether it is so irregular that the spelling of each word must be learned as a separate problem of rote memory. This question would appear to have been resolved by linguistic analyses of the past twenty-five years which have revealed that English sound-symbol correspondence rules, although sometimes complex, have an impressive (though not perfect) degree of consistency. Spelling series of the 1960's and 1970's have reflected the linguistic findings. Most modern series represent a compromise between the two organizing principles of word frequency, and grouping and sequencing words according to structural characteristics.

The question of what it is children are actually learning when they learn to spell was raised, and some arguments as well as research cited which indicate they are doing much more than memorizing each word as a random sequence of letters or as a distinct visual form.

It was concluded that children, when they learn to spell, are learning a great deal about the structure of language. Being able to take advantage of the sound frame of the word in speech to sequence the letters in spelling was seen as the necessary substructure for developing the ability to spell. To the extent children are able to make use of knowledge about the word's phonological (and morphological) form to order the sequence of letters that comprise the word's orthographic form, to that extent they do not have to learn each word as a rote association between an arbitrary letter string and the word's meaning (its semantic form).

Spelling disabled children are seen as handicapped primarily in making use of phonological information because of weakness in phonemic analysis, so that the load on memory is excessive.

The question of whether there are qualitatively distinct types of spelling disability was discussed and some of the pertinent literature reviewed. The conclusion was that spelling disabilities vary largely on the dimension of severity of the problem, with the most severe cases unable to manage even simple phonetic spelling.

A number of remedial methods were reviewed. Major methods (especially Orton-Gillingham and those working in this tradition) have little in common with the way spelling has been taught in the schools for the past fifty years but a great deal in common with the way spelling was taught historically. Points of commonality are 1) teaching of reading and spelling as coordinated subjects, 2) careful sequencing of words from simple to complex with words ordered to reveal the regularities of phoneme-grapheme correspondences, 3) an essentially multisensory approach, with an emphasis on writing as an aid to learning to read, 4) an emphasis on mastery of each step before proceeding to the next.

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